REPORT DOCUMENTATION PAGE

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5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

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12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

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G2

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO) 14 May 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-118**
C.T. Liu, "Monitoring Initiation and Growth of Crack in a Particulate composite Material Using Nondestructive Testing Techniques"

2001 Society for Experimental Mechanics Conf. **(Statement A)**
(Portland, OR, 4-6 Jun3 2001) (Deadline 25 May 2001)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.
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APPROVED/APPROVED AS AMENDED/DISAPPROVED

_____

PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

MONITORING INITIATION AND GROWTH OF CRACKS IN A PARTICULATE COMPOSITE MATERIAL USING NONDESTRUCTIVE TESTING TECHNIQUES

C. T. Liu

AFRL/PRSM
10 E. Saturn Blvd.

Edwards AFB CA 93524-7680

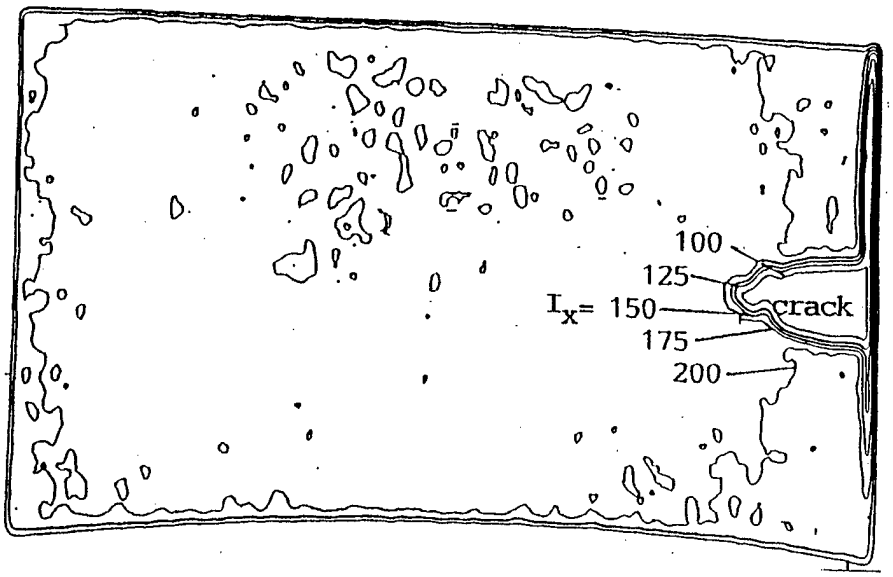
Objective

- **Investigate Damage Initiation and Evolution and Crack Growth Behavior in a Highly Filled Polymeric Material.**

Conclusions

- Real-time x-ray data reveals that damage rate increases rapidly prior to the formation of a crack.
- During the stable crack growth stage, the damage zone size and the intensity of damage increase with increasing time.
- During the unstable crack growth stage, the damage zone size and the intensity of damage decrease with increasing time.
- The results of strain measurement and numerical analysis reveal that the normal strain increases rapidly prior to the formation of a crack.
- The real-time x-ray technique is a promising technique to monitor damage initiation and evolution processes in the particulate composite material.

Iso-Intensity Contours of Transmitted X-Ray Energy I_x



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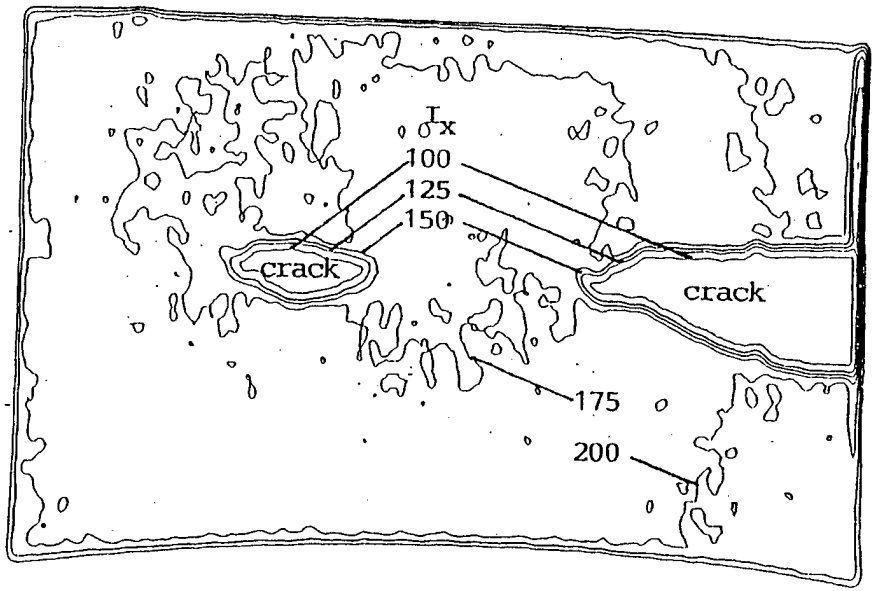

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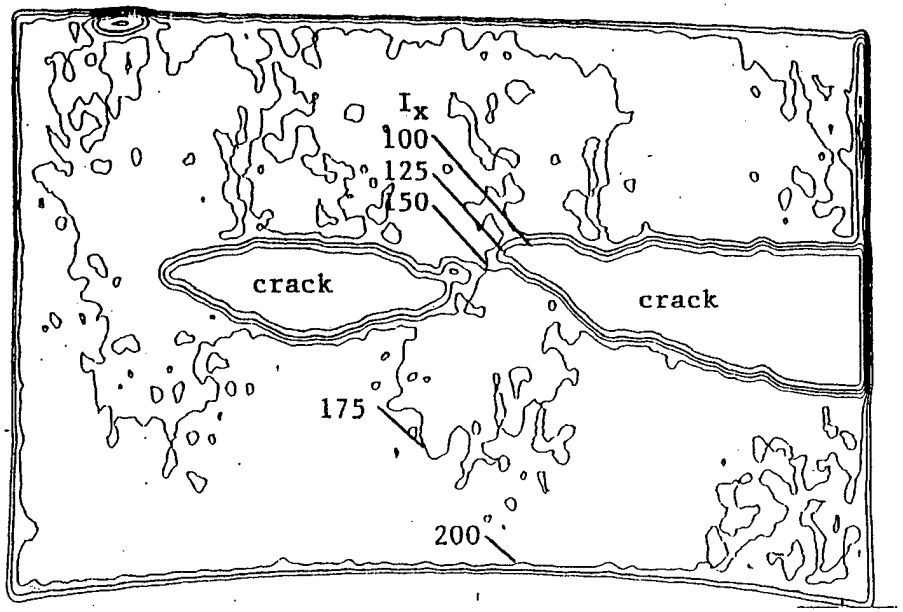
Iso-Intensity Contours of Transmitted X-Ray Energy I_x



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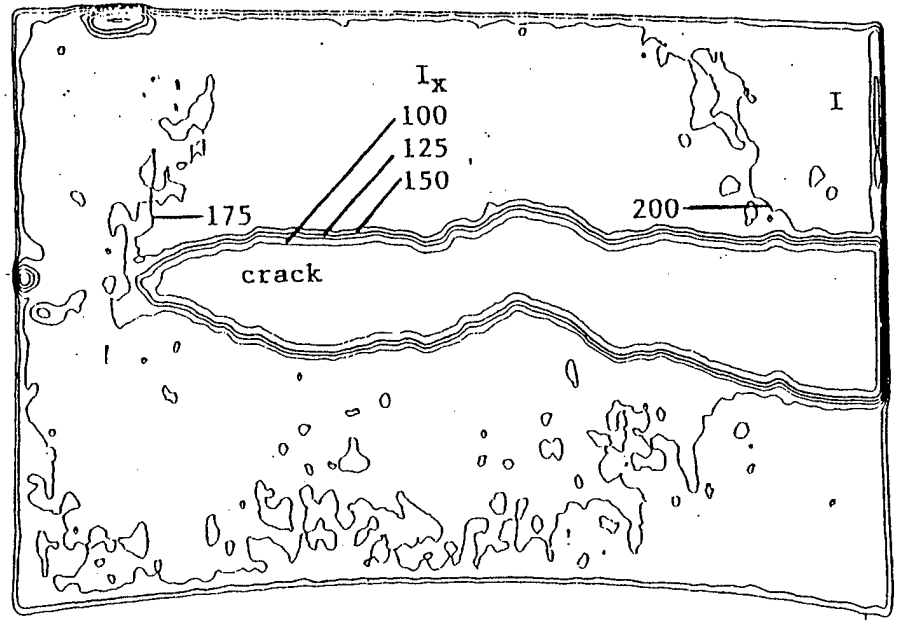

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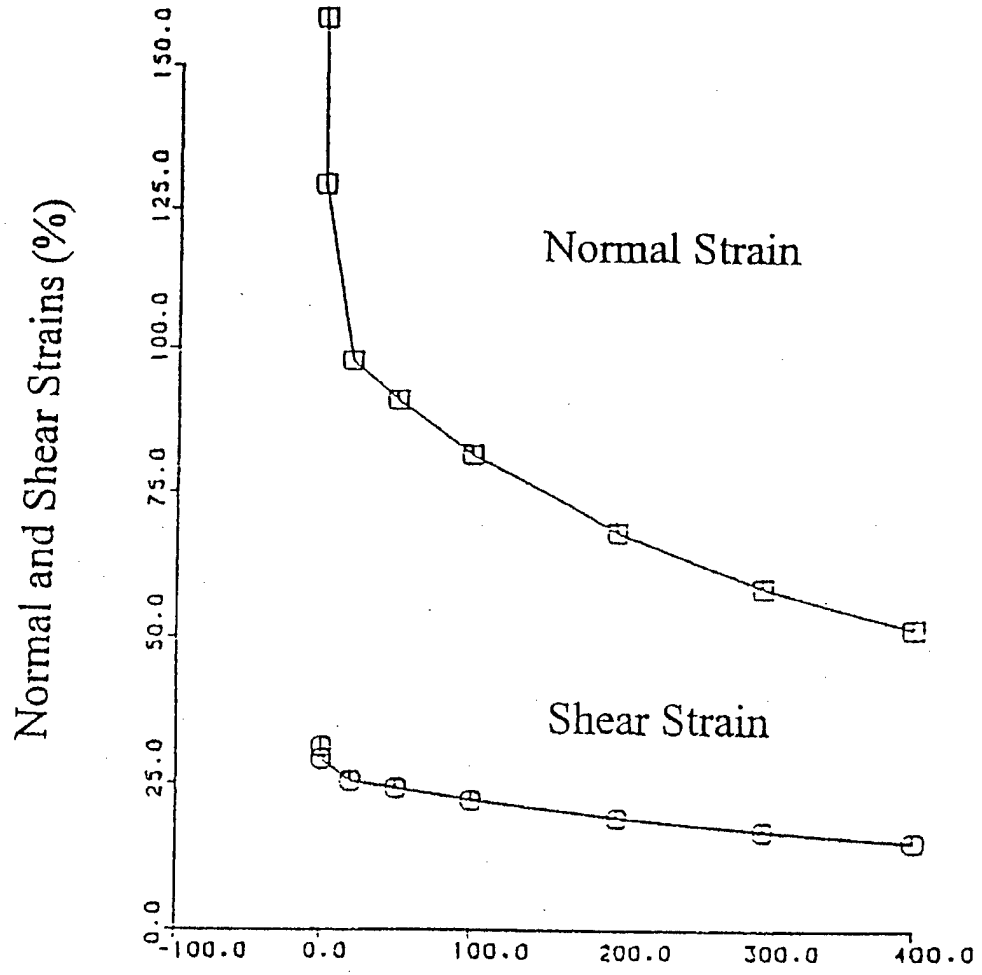
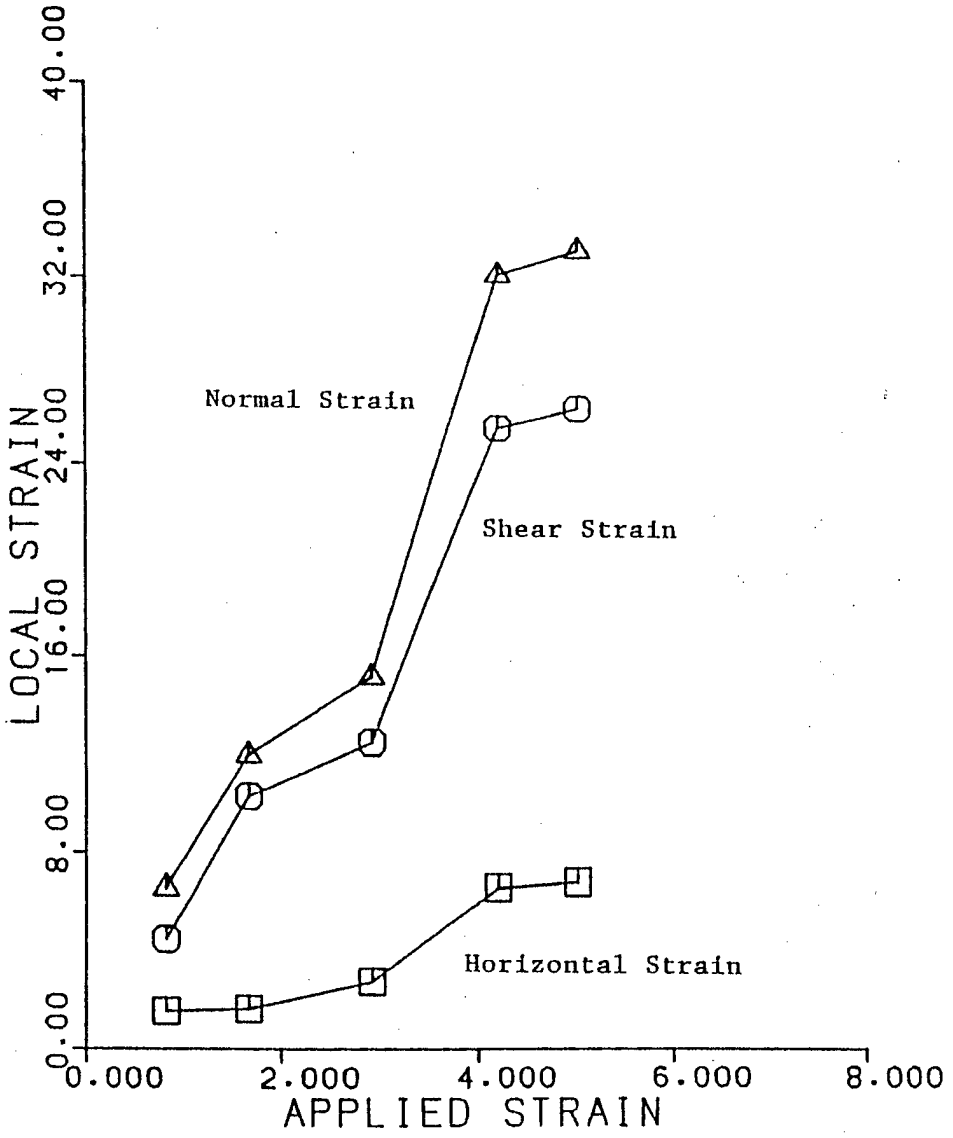
Normal and Shear Strains Versus Young's Modulus



Local Strain Versus Applied Strain



X-Ray Intensity $\bar{I}_x$ Versus Applied Strain